National Institute of Environmental Health Sciences

Climate change impact on flood hazard in Europe: An assessment based on high-resolution climate simulations

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Abstract:

Global warming is generally expected to increase the magnitude and frequency of extreme precipitation events, which may lead to more intense and frequent river flooding. This work assesses the implications of climate change for future flood hazard in Europe. Regional climate simulations from the HIRHAM model with 12-km horizontal resolution were used to drive the hydrological model LISFLOOD, and extreme value techniques were applied to the results to estimate the probability of extreme discharges. It was found that by the end of this century under the Special Report on Emission Scenarios (SRES) A2 emissions scenario in many European rivers extreme discharge levels may increase in magnitude and frequency. In several rivers, most notably in the west and parts of eastern Europe, the return period of what is currently a 100-year flood may in the future decrease to 50 years or less. A considerable decrease in flood hazard was found in the northeast, where warmer winters and a shorter snow season reduce the magnitude of the spring snowmelt peak. Also in other rivers in central and southern Europe a decrease in extreme river flows was simulated. The results were compared with those obtained with two HIRHAM experiments at 50-km resolution for the SRES A2 and B2 scenarios. Disagreements between the various model experiments indicate that the effect of the horizontal resolution of the regional climate model is comparable in magnitude to the greenhouse gas scenario. Also, the choice of extreme value distribution to estimate discharge extremes influences the results, especially for events with higher return periods.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2, SRES B2

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event

Extreme Weather Event: Flooding

Geographic Feature: ☑

resource focuses on specific type of geography

Freshwater

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Europe

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content